

# HATCHERY AND GENETIC MANAGEMENT PLAN

## (HGMP)

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**Hatchery Program:** Keta Creek Hatchery

**Species or Hatchery Stock:** Green River Fall Chinook

**Agency / Operator :** Muckleshoot Indian Tribe

**Watershed and Region:** 09.0001 – Green River ( Puget Sound)

**Date Submitted:** \_\_\_\_\_

**Date Last Updated:** May 2003

### SECTION 1. GENERAL PROGRAM DESCRIPTION

#### 1.1) Name of hatchery or program.

Keta Creek Hatchery –Fall Chinook fry program

#### 1.2) Species and population (or stock) under propagation, and ESA status.

Soos Creek Hatchery Fall Chinook – *Onchorhynchus tshawytscha* - Status: Not Listed

#### 1.3) Responsible organization and individuals

**Name (and title):** Dennis Moore, Fish Enhancement Manager

**Agency or Tribe:** Muckleshoot Indian Tribe

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**Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:**

The Tribe receives eyed chinook eggs from the Washington Department of Fish and Wildlife's (WDFW) Soos Creek Hatchery that are reared at the Tribe's Keta Creek

hatchery. These eggs translate to 600,000 fry that are released above the Howard Hanson flood control dam at RM 64.5. Fish released above the dam are released into the main stem Green River and various tributaries that are accessed from City of Tacoma and U.S. Forest Service lands within the upper watershed.

**1.4) Funding source, staffing level, and annual hatchery program operational costs.**

Tribal / BIA – 4-15 staff - O&M 300K-350K (includes all programs/species).

**1.5) Location(s) of hatchery and associated facilities.**

Keta Creek Hatchery is located at RM 1.0 on Crisp Creek (WRIA 09.0113), a right bank tributary of Green River (WRIA 09.0001) at RM 40.2 between the cities of Auburn and Black Diamond, Washington.

**1.6) Type of program.**

Integrated Harvest /Research

**1.7) Purpose (Goal) of program.**

**1.7.1** The goal of this on-going program is to evaluate survival of hatchery fish above Howard Hanson Dam.

**1.7.2** Another goal is to integrate this program with stock management and habitat protection and restoration programs to minimize biological risks to naturally produced fall Chinook in the lower river. The Muckleshoot Indian Tribe reserves the right to discontinue current production; modify the current production level; or to change species reared to meet the needs and policy direction of the Tribe.

**1.8) Justification for the program.**

In 1911, the City of Tacoma constructed a diversion dam across the Green River at River Mile 61 to divert surface water for municipal and industrial needs. This dam blocks all up-stream returning adult salmon. In 1962, the U.S. Army Corps of Engineers completed the Howard Hanson dam and began to retain water behind this dam upstream of Tacoma's dam to regulate downstream flooding. This project will help determine if mitigation for these blockages is possible.

### 1.9) List of program “Performance Standards”.

<b>Goal</b> (See Section 1.7-1.8)	<b>Performance Standard</b> (See Section 1.9)	<b>Performance Indicator</b> (See Section 1.10)	<b>Methods/Comments</b> (See Sections 11.1)
Goal 1 Evaluate survival of hatchery fish above Howard Hanson Dam	Out-migration is successful through the Howard Hanson Dam and the Tacoma diversion dam and fingerling smolts have a normal condition factor.	<b>Addressing Benefits</b>  Survival and contribution rates.	Currently completing a CWT study of survival through the Corps’ Howard Hanson Dam, ocean survival, and fishery exploitation rates (Brood years 1993-1995).  Howard Hanson Dam out-migration study utilizing downriver WDFW screw trap- for brood years 1999-2001.
Goal 2 Integrate this program with stock management and habitat protection and restoration programs to minimize biological risks to naturally produced fall Chinook in the lower river.	WDFW maintains the genetic integrity and diversity of the local-origin broodstock by using approved mating protocols	<b>Addressing Risks</b>  Effective population sizes	Unless prevented by exigent circumstances the Tribe will mass mark all fall-Chinook salmon to generate information needed to refine stray rate analyses for Keta Creek and Green River hatcheries WDFW continues to collect adults and uses approved mating protocols.

<b>Goal</b> (See Section 1.7-1.8)	<b>Performance Standard</b> (See Section 1.9)	<b>Performance Indicator</b> (See Section 1.10)	<b>Methods/Comments</b> (See Sections 11.1)
	<p>Provide maximum survival and fish health conditions using disease control and prevention techniques.</p> <hr/> <p>Minimize interactions with other salmon populations through proper rearing and release strategies</p>	<p>Chinook are certified for release with minimal chemical treatments.</p> <hr/>	<p>Northwest Indian Fisheries Commission (NWIFC) Fish Pathologists monitor the health of hatchery stocks on a monthly basis and recommend preventative actions/strategies to maintain fish health.</p> <hr/> <p>Juveniles are released at or above Howard Hanson Dam to minimize interaction, and allows for a more natural emigration strategy.</p>

### **1.10) List of program “Performance Indicators”, designated by benefits and risks.**

“Performance Indicators” determine the degree that program standards have been achieved, and indicate the specific parameters to be monitored and evaluated. Adequate monitoring and evaluation must exist to detect and evaluate the success of the hatchery program and any risks to or impairment of recovery of affected, listed fish populations.”

#### **1.10.1) “Performance Indicators” addressing benefits.**

The survival of program chinook that contribute to harvestable fish for the Tribe will be monitored by mass marking ( adipose clip) the fry before they are released and captured downstream, along with unmarked chinook, in the WDFW juvenile screw trap on the Green River. Funding for the screw trap sampling is provided by WDFW. All harvested returning adults will also be surveyed in the Tribe’s fisheries to determine the portion of Keta Creek Hatchery and Soos Creek Hatchery origin chinook.

#### **1.10.2) “Performance Indicators” addressing risks.**

There is little risk of predation from hatchery chinook on natural juvenile chinook because these 600,000 fed-fry fall hatchery chinook are released at an average size of 150 fish per pound in March above the Howard Hanson dam, which is devoid of natural chinook. Spatial and temporal separation and the relatively similar sizes of Keta Creek hatchery and natural chinook should adequately limit the likelihood for predation below the dam. Also, under current conditions, dam induced mortalities indicate that far fewer than 600,000 chinook juveniles survive through Howard Hanson to migrate seaward. (See Section 1.12 below)

According to the WDFW HGMP, mating protocols will be followed. At Keta Creek hatchery Chinook fry will be certified healthy prior to release.

#### **1.11) Expected size of program.**

##### **1.11.1) Proposed annual broodstock collection level (maximum number of adult fish).**

Adult Chinook return to the Soos Creek Hatchery, where WDFW collects broodstock for all of WDFW's programs ( approximately 3,500 adults) on the Green River including broodstock needed for transfer to Muckleshoot Tribe's Keta Creek Hatchery( approximately 400 adults needed to supply 600,000 eggs).

##### **1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.**

<b>Life Stage</b>	<b>Release Location</b>	<b>Annual Release Level</b>
<b>Fry</b>	See attachment 1 "Current Planting Location Schedule"	600,000 (currently)

The current annual production of fall Chinook at the Keta Creek Hatchery is 600,000 fed-fry. Should Muckleshoot Tribe choose to continue the fall Chinook program at Keta Creek and increase production levels over those set out in this condition, Muckleshoot Tribe will reinstate consultation under Section 7 or enter government to government discussions with NMFS under Section 4(d).

#### **1.12) Current program performance, including estimated smolts-to-adult survival rates, adult production levels, and escapement levels. Indicate the source of these data.**

The tribe participated in a CWT study to determine survival through the Howard Hanson dam, ocean survival, and fishery exploitation rates for the brood years of 1993 through 1995. Additional information about the CWT study conducted 1993-95 is available in Attachment 2 titled 'CWT SUMMARY REPORT'

From coded wire-tag (CWT) recovery data, the estimated minimum survival rates (from fry release to adults) for Keta Creek fall chinook (brood years 1993-1995) average 0.0126% of the annual juvenile release (range 0 to 0.03%), based on CRAS. Assuming a total survival rate of 0.0126% and annual plants of 600,000 fry, the Keta Creek hatchery program may result in the annual production of 75 adult fall chinook (ages 2-6) for harvest and escapement. For

broodstock years 1993-1995, an average of 28% of the coded wire tag recoveries occurred in freshwater fisheries and escapement. If the freshwater return percentage is assumed to be status quo, then the Keta Creek program may contribute 21 adult fall chinook to in-river fisheries and escapement each year.

It should be noted that juvenile out-migrating studies conducted at Howard Hanson Dam by U.S. Fish and Wildlife Service in 1991 and 1992 indicate that survival through the dam were 1 percent and 14 percent respectfully. Measures to correct this situation have been explored by the U.S. Army Corps of Engineers and are in planning stages of development.

**1.13) Date program started (years in operation), or is expected to start.**  
1987

**1.14) Expected duration of program.**

Unknown

**1.15) Watersheds targeted by program.**

Green River – 09.0001, specifically areas above and or at the Howard Hanson at RM 60.5.

**1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.**

Assuming availability of eggs, an alternative to this program would be to identify other incubation and rearing facilities within the basin.

This alternative was rejected because alternative facilities are not available.

**SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.**

**2.1) List all ESA permits or authorizations in hand for the hatchery program.**

None at this time

**2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.**

**2.3)**

The Green River is managed for an escapement goal of 5,800 natural spawners. This goal has been met in 9 of the past 12 years (1988-1999), according to WDFW's Chinook run reconstruction tables. The 12 year average escapement is 7,598 adult Chinook, ranging from 2,476 to 11,512 (WDFW run reconstruction tables).

**2.2.1) Description of ESA-listed salmonid population(s) affected by the program.**  
**Chinook salmon –**

At this time, Green River naturally-produced adult chinook are listed under ESA. They are

physically indistinguishable from hatchery adults. There are hatchery and naturally-produced adults that return to the spawning grounds and to the Soos Creek Hatchery operated by WDFW. Based on spawning survey data collected since 1995 approximately 70% of the natural spawning occurs upriver from the mouth of Soos Creek (at River Mile 33.7) to the Tacoma diversion dam (at River Mile 61). Chinook also spawn in Newaukum, and Soos Creeks, tributaries to the Green River. Currently WDFW and MITFD surveys for spawning Chinook in the main stem Green River between RM 23 and RM 61, the upstream extent of current anadromous access.

**Identify the ESA-listed population(s) that will be directly affected by the program.**

Puget Sound chinook that originate from naturally spawning adults in the Green River are the ESA-listed population that would be directly affected by the program; however, the majority of the direct effects come from the broodstock collection activities that WDFW conducts at the Soos Creek Hatchery.

**Identify the ESA-listed population(s) that may be incidentally affected by the program.**

Puget Sound Fall chinook that originate from naturally spawning adults in the Green River may be incidentally affected by the program because the impacts of this hatchery program occur primarily downstream of the TPU Diversion Dam during out-migration when natural and hatchery produced chinook overlap in time and space. To the extent the outplants produce a return, any indirect impact would be below Howard Hanson Dam. The areas where the Keta Creek chinook are planted do not currently contain any naturally produced chinook. Since this hatchery does not handle listed fish, the affects are incidental, not direct, and minimal if existent at all.

**2.2.2) Status of ESA-listed salmonid population(s) affected by the program.**

**Describe the status of the listed natural population(s) relative to “critical” and “viable” population thresholds**

Critical / Viable population thresholds under ESA have not been determined; however the SASSI report (WDFW) determined this population (Green-Duwamish Summer/Fall Chinook) to be “healthy”.

**Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage or other measures of productivity for the listed population.**

**Indicate the source of these data.**

Not Available

**Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data.**

For the return years for 1987 through 1998, on average, each Green River natural spawner produces 2.33 adults returning to Washington waters, based on the WDFW Chinook run-reconstruction tables. The 12-year average escapement is 7,598 based on the WDFW Chinook run-reconstruction tables. The escapement goal of 5,800 chinook has been exceeded in 9 of the last 12 years (1988-1999)

**Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.**

There is limited data for Keta Creek hatchery chinook over this period. However, for Soos Creek Hatchery chinook, the WDFW reports the ratio of hatchery-origin adults on the spawning grounds averaged 33.4% between 1989 and 1997, based on WDFW coded-wire tag data (see WDFW's Soos Creek Hatchery HGMP) This data is based on a small sample size (<4%) in five of these years and was sampled from a limited area (RM 33.8 to 41.4 only); therefore, it is not be appropriate to apply this data river-wide.

**2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take**

**Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.**

N/A

**Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken and observed injury or mortality levels for listed fish.**

There are no past takes at Keta Creek because this facility does not collect its own broodstock; rather eyed eggs come from WDFW's Soos Creek Hatchery.

**Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).**

There is no direct"take" as a result of this program.

**Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.**

There is no need for a contingency plan because there is no direct take at Keta Creek.



### **SECTION 3. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES**

#### **3.1) Describe alignment of the hatchery program with any ESU-wide hatchery plan (Explain any proposed deviations from the plan or policies.**

The development of this and other hatchery HGMPs can be used to develop the Puget Sound ESU wide hatchery plan.

#### **3.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.**

The Puget Sound Salmon Management Plan  
Co-Managers Future Brood Document  
Co-Managers Fish Health Policy  
Watershed Access agreement with the City of Tacoma

#### **3.3) Relationship to harvest objectives.**

See Co-managers Comprehensive Chinook Management plan for Puget Sound.

##### **3.3.1) Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last twelve years (1988-99), if available.**

The fisheries benefiting from the program are the Muckleshoot and Suquamish Tribe's Treaty terminal net fishery. Other non-tribal fisheries also benefit from this program. Tag data are available for brood years 1992-1994 (see attachment 2)

#### **3.4) Relationship to habitat protection and recovery strategies.**

Howard Hanson Dam and the City of Tacoma Diversion Dam limit upper river salmonid survival. The lower river basin is highly developed, channelized, diked, and industrialized.

#### **3.5) Ecological interactions.**

Salmonid and non-salmonid fishes that could negatively impact the program are:

cutthroat trout, bull trout, coho salmon, and sculpins that prey on Chinook, etc. Salmonid and non-salmonid fishes that could be negatively impacted by the program are adult bull trout, although to what extent in the Green River is unknown.

## **SECTION 4. WATER SOURCE**

### **4.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.**

The main water sources for the Tribe's Keta Creek hatchery are surface water from Crisp Creek and groundwater from Keta Springs. Crisp Creek surface water is used mainly for rearing and holding, whereas Keta Spring water is used for incubation and domestic uses. Keta Creek pumped water is swirl separated, disinfected via UV system, then liquid O<sub>2</sub> is injected prior to use for rearing. Rearing waste is diverted (vacuum) to a clarifier system before being discharged back into Crisp Creek.

Water quality in Crisp Creek above the Tribe's hatchery operation facilities meets most of Washington State's Class A standards, which are the current standards that apply to the creek

The existing water quality data collected in 1993 and 1994 indicate that Crisp Creek meets state water quality standards for temperature, turbidity, dissolved oxygen, and pH.

### **4.2) Indicate risk aversion measures that will be applied to minimize the likelihood for the take of listed natural fish as a result of hatchery water withdrawal, screening, or effluent discharge.**

There is no opportunity to take listed natural chinook at Keta Creek because chinook salmon do not spawn in Crisp Creek. Also, the water temperatures and current habitat conditions make it unlikely that bull trout use Crisp Creek. There are sections of Crisp Creek below the hatchery that have very limited shade and cover due to adjacent non-tribal activities that include horse pastures. The Keta Creek Hatchery intake screens conform to NMFS screening guidelines to minimize the risk of entrainment of juvenile listed fish.

Fish waste and un-eaten fish feed is vacuum pumped from rearing raceways and diverted into settling tanks. Clarified waste water is then allowed to enter Crisp Creek 500 feet downstream of hatchery intake pumps.

## **SECTION 5. FACILITIES**

### **5.1) Broodstock collection facilities (or methods).**

See WDFW's HGMP for Soos Creek Hatchery

The Keta Creek hatchery program does not collect adult chinook to create broodstock.

Rather, the hatchery receives eyed eggs from the WDFW's Soos Creek Hatchery. Broodstock trapping, transportation, holding, spawning are all done by WDFW staff at the Soos Creek Hatchery.

## **5.2) Fish transportation equipment (description of pen, tank truck, or container used).**

The eggs are transported from the Soos Creek Hatchery to the Keta Creek hatchery in hatching baskets. At the Soos Creek Hatchery, 25,000 eyed eggs are measured out in wire baskets. Then the Soos Creek Hatchery staff calls the Keta Creek hatchery staff to announce that the eggs are ready for transport. The staff at Keta Creek prepare hemp gunny bags for the journey. These bags are disinfected in a 100 ppm iodine solution and counted to ensure that we have the correct number. These bags are then loaded onto a sterilized hatchery pick-up truck for the 15 minute trip to the Soos Creek Hatchery. Once at the hatchery, Keta Creek staff retrieves the baskets of 25, 000 eggs baskets and arrange them in single layers on the truck. The baskets are covered with 2 layers of sterile hemp bags and transported back to Keta Creek. Once at the Keta Creek hatchery, the staff remove the baskets one at a time and place them in the hatchery trough for a 15 minute iodine bath mixed at 100 ppm. Each 25,000 egg basket is divided into 3 Heath Hatching Trays. The fingerlings are transported to the upper Green by Muckleshoot Fisheries staff. Cooler watershed water is first loaded on the Tribal Tanker at the Tacoma dam, and then fingerlings are loaded at Keta Creek into tanks equipped with both O2 and aerators, and driven to the upper watershed by Muckleshoot Fisheries staff.

## **5.3) Broodstock holding and spawning facilities.**

See WDFW's HGMP for Soos Creek Hatchery

## **5.4 Incubation facilities.**

The eggs are eyed up at WDFW's Soos Creek Hatchery. These eyed eggs are hatched at the Keta Creek hatchery in Heath Techna style incubators.

## **5.5) Rearing facilities.**

Chinook fry are reared in two 10'x 100'x 4' raceways at Keta Creek Hatchery.

## **5.6) Acclimation/release facilities.**

Fingerling fall chinook are reared to release size of approximately 3 grams and are transported to up-river areas for direct release into one of 72 potential planting locations. Truck-mounted transport tanks are used to transport chinook fingerlings to the release locations. Fish in the transfer tanks are supplied with oxygen and aerators for the 45 to 90 minute transfer period

**5.7) Describe operational difficulties or disasters that led to significant fish mortality.**  
None

**5.8) Indicate available back-up systems, and risk aversion measures that will be applied, that minimize the likelihood for the take of listed natural fish that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.**

There are no listed fish at Keta Creek Hatchery; however Keta Creek has an emergency generator and alarm system. In addition, there are staff living at the hatchery that monitor its equipment 7 days a week.

## **SECTION 6. BROODSTOCK ORIGIN AND IDENTITY**

**Describe the origin and identity of broodstock used in the program, its ESA-listing status, annual collection goals, and relationship to wild fish of the same species/population.**

**6.1) Source.**

This stock originated from adults trapped in the Green River (see WDFW's HGMP for Soos Creek Hatchery).

**6.2) Supporting information.**

**6.2.1) History.**

See WDFW's HGMP for Soos Creek Hatchery

**6.2.2) Annual size.**

See WDFW's HGMP for Soos Creek Hatchery

**6.2.3) Past and proposed level of natural fish in broodstock.**

See WDFW's HGMP for Soos Creek Hatchery.

**6.2.4) Genetic or ecological differences.**

See WDFW's HGMP for Soos Creek Hatchery

**6.2.5) Reasons for choosing.**

See WDFW's HGMP for Soos Creek Hatchery

**6.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish that may occur as a result of broodstock selection practices.**

See WDFW's HGMP for Soos Creek Hatchery

## **SECTION 7. BROODSTOCK COLLECTION**

Information pertaining to this section can be found in WDFW's HGMP for Soos Creek Hatchery

**7.1) Life-history stage to be collected (adults, eggs, or juveniles).**

**7.2) Collection or sampling design.**

**7.3) Identity.**

**7.4) Proposed number to be collected:**

**7.4.1) Program goal (assuming 1:1 sex ratio for adults):**

**7.4.2) Broodstock collection levels for the last twelve years (e.g. 1988-99), or for most recent years available:**

<b>Year</b>	<b>Adults Males</b>	<b>Females</b>	<b>Jacks</b>	<b>Eggs</b>	<b>Juveniles</b>
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**7.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.**

**7.6) Fish transportation and holding methods.**

**7.7) Describe fish health maintenance and sanitation procedures applied.**

**7.8) Disposition of carcasses.**

**7.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the broodstock collection program.**

## **SECTION 8. MATING**

**Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.**

For information pertaining to this section see WDFW's HGMP for Soos Creek Hatchery

**8.1) Selection method.**

**8.2) Males.**

**8.3) Fertilization.**

**8.4) Cryopreserved gametes.**

**8.5) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.**

## **SECTION 9. INCUBATION AND REARING -**

**Specify any management *goals* (e.g. “egg to smolt survival”) that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.**

### **9.1) Incubation:**

#### **9.1.1) Number of eggs taken and survival rates to eye-up and/or ponding.**

See WDFW’s HGMP for Soos Creek Hatchery

#### **9.1.2) Cause for, and disposition of surplus egg takes.**

See WDFW’s HGMP for Soos Creek Hatchery

#### **9.1.3) Loading densities applied during incubation.**

Chinook eggs are incubated from the eyed stage to hatch-out in Heath Techna style trays loaded at a maximum of 7,000 eggs per tray. Eggs are 5 mm in size. The incubator flows are 3-5 gallons per minute.

#### **9.1.4) Incubation conditions.**

The eggs receive spring water from Keta Creek Springs and/or surface water from Crisp Creek. The eggs and subsequent alevins are checked weekly or more often as needed for silt and or other problems. Incubation water oxygen levels range from 80 to 85% saturation. The influent dissolved oxygen levels are between 80 and 85%. The effluent dissolved oxygen levels are also between 80 to 85%. Water temperature for incubation averages 50 degrees Fahrenheit...

#### **9.1.5) Ponding.**

Fry are brought out at buttoned stage. This occurs typically mid-January depending on water temperature and other environmental factors. Fry are about 900 per pound and 38

mm in length. The length ranges between 36 to 40 mm. The range for fry weights is 875 fish /lb to 925 fish/lb.

**9.1.6) Fish health maintenance and monitoring.**

Fish health services are provided by the Northwest Indian Fisheries Commission's Olympia Fish Health Center pathologists. In addition, MIT hatchery staff have taken the U.S. Fish and Wildlife Service's short course on Fish Health Management. Prior to loading the incubators, the eggs are final picked. Dead eggs are also removed from each lot in the trays during weekly checks. Usually, if there are any fish health problems, they occur after the ponding of fry.

**9.1.7) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish during incubation.**

N/A

**9.2) Rearing:**

**9.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to smolts) for the most recent twelve years (1988-99), or for years dependable data are available.**

The average survival from eyed egg to fry is 92% for years 1995-1999.  
See also Table in section 10.3

**9.2.2) Density and loading criteria (goals and actual levels).**

Density in rearing raceways do not exceed 0.8 pounds fish/cubic feet.

**9.2.3) Fish rearing conditions**

MITFD staff monitor the rearing ponds daily. Water temperature is recorded daily; dissolved oxygen is measured weekly off of a recording device that measures temperature and dissolved oxygen. During the rearing period, water temperatures are between 49 and 52 degrees Fahrenheit. Dissolved oxygen levels are between 11 ppm and 9 ppm. The oxygen levels are maintained at 100 to 105 percent saturation at the head of raceways and does not go below 90 percent at outlet. To maintain these oxygen levels, liquid O<sub>2</sub> is injected into Packed Columns ahead of Head Tanks. All fish waste and uneaten feed is vacuumed from each rearing vessel and piped to pollution abatement settling ponds. The pond is left to decant and once this material is dry, it is used on-station to fertilizer the surrounding tree farm.

**9.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected during rearing, if available.**

Rearing fish are grab sampled weekly for length and weight samples and visual health needs. This information is used for stock management purposes for determining density and loading criteria, and release timing.

**Chinook fry growth rates at Keta Creek Hatchery**



1998 Rearing		
Date	Length ( mm)	Weight ( grams)
8-Jan	39	0.54
20-Jan	43	0.74
26-Jan	44	0.78
2-Feb	48	1.1
10-Feb	52	1.48
19-Feb	57	2.1
6-Mar	64	2.9

1999 Rearing		
Date	Length in mm	Weight in grams
26-Jan	39	0.5
8-Feb	40	0.72
16-Feb	44	0.84
23-Feb	47	1.2
22-Mar	61	2.6

2000 Rearing		
Date	Length in mm	Weight in grams
19-Jan	38	0.51
31-Jan	40	0.64
7-Feb	43	0.9
14-Feb	49	1.2
22-Feb	51	1.5
28-Feb	54	1.8
6-Mar	55	1.9
17-Mar	60	2.6
27-Mar	67	3.4

1998- 840/lb to 156/lb in 56 days	0.042grams growth per day
1999- 907/lb to 174/lb in 54 days	0.039grams growth per day
2000- 889/lb to 133/lb in 67 days	0.043grams growth per day

**9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.**

Energy reserve data is not available. Growth rates are identified in Section 9.2.4

**9.2.6) Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W. /day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).**

Fish are fed a diet of Moore-Clark Nutra at a rate of up to 2.5% body weight per day. Feed Conversion rate is around 0.75.

**9.2.7) Fish health monitoring, disease treatment and sanitation procedures.**

Preventative care is promoted through routine health monitoring. NWIFC pathologists conduct fish health exams at Keta Creek on a monthly or more frequent basis from the time fish “swim-up” until they are released. Monthly exams include an evaluation of rearing conditions, as well as, lethal sampling of small numbers of juvenile fish to assess fish health status of the population and to detect pathogens of concern. The results are reported to hatchery managers along with any recommendations

for improving or maintaining fish health. A vaccine produced by the Fish Commission may be used when appropriate to prevent the onset of enteric red-mouth disease. The entire health history for this stock is maintained in a relational database called AquaDoc.

**9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.**

N/A

**9.2.9) Indicate the use of “natural” rearing methods as applied in the program.**

At this time, chinook fry at Keta Creek are exposed to natural bird predators (i.e. Kingfishers) in the rearing ponds. Once the fry are released into the Upper Green River, they are released into a high mountain area with a much shorter growing season and cooler water (as compared to the lower mid-river environment of lower elevation). These chinook will spend on average 2 months in this higher elevation area left to their own means for survival, thus looking and behaving more like a “natural” fish when they out-migrate.

**9.2.10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish under propagation.**

The focus of the Keta Creek program on 150 fpp fingerling production limits the degree of hatchery intervention and allows the fish to rear and adapt to the Upper Green River release locations, and mimics the natural emigration strategy for Puget Sound ESU Fall Chinook.

**SECTION 10. RELEASE**

Describe fish release levels, and release practices applied through the hatchery program.

**10.1) *Proposed fish release levels***

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Fingerling	600,000	150	March	Upper Green River/tribs

### 10.2) Specific location(s) of proposed release(s).

River: Green River 9.0001 and

Release point: Release site schedule and locations (see Attachment 2)

Major watershed: Green-Duwamish River

Basin or Region: Puget Sound

### 10.3) Actual numbers and sizes of fish released by age class through the program.

Release year	Eggs/ Transferred to Keta (in millions)	Eggs per pound	Fry Release numbers	Avg size (ffp)	Eyed to Release %	Release date	Release protocol	
1988	2.0 M		1.8m	385	90			
1989	3.0 M		2.52m	226	84			
1990	3.0 M		2.32	140	77			
1991	4.0 M		3.76m	510	94			
1992	1.5 M		1.2m	322	80			
1993	2.0 M	1225	1.97m	357	98			
1994	0.6 M	1200	0.503m	302	83			
1995	0.6 M	1200	0.553m	215	92	20Mar.	After CWT	Forced
1996	0.6 M	1375	0.672m	208	95	15Mar	Make room	Forced
1997	.0650 M	1300	0.641m	162	98	10Mar	Make Room	Forced
1998	.6 M	1350	0.554	145	92	15Mar	Make Room	Forced
1999	.6 M	1250	0.557	173	92	25Mar	Make Room	Forced
Average	Recent is 0.6m	1271	Recent 0.56m	Recent is 200	Recent is 92	mid-March		

**Data source: (Link to appended Excel spreadsheet using this structure. Include hyperlink to main database)**

**10.4) Actual dates of release and description of release protocols.**

See above table for actual dates

**10.5) Fish transportation procedures, if applicable.**

The fry are put into the Tribe's tank truck for the 45-90 minutes trip to the area above the Howard Hanson dam. The fish loading densities do not exceed 0.5 lbs per gallon of water. Oxygen is supplied from bottled gas via aerators. There is no need for temperature control because water is obtained from the upper watershed and the fry have a limited transport time to their release sites. See 10.6 for further information.

○ **Acclimation procedures (methods applied and length of time).**

Water that exits the Howard Hanson dam is taken on at the Tacoma headworks area. This cooler water mimics the temperature conditions of the Upper Green River planting sites. At the hatchery, the fry are weighed onto the truck in buckets containing warmer hatchery water. The mixing of temperatures between the hatchery water and the Upper Green River water provides for acclimation during the 45 to 90 minute trip to the watershed above the dams.

**10.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery adults.**

Approximately 80% of the total released fry from brood years 1993-1995 were tagged with CWTs. An adipose fin clip mark was applied to 100% of the fry from brood years 1999-2002

**10.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.**

The Keta Creek hatchery only receives the number of eggs necessary for its fry program.

**10.9) Fish health certification procedures applied pre-release.**

As stated for egg incubation, the NWIFC fish health lab provides pathologists who certify all fish healthy before release.

**10.10) Emergency release procedures in response to flooding or water system failure.**

Depending upon the circumstances, the emergency release procedure calls for a release of fish based on the highest probability of surviving to adulthood or the fish with the highest probability of sustaining catastrophic loss if held at the hatchery. This decision depends on the species at the hatchery at the time of the emergency and their best chances for survival.

**10.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from fish releases.**

The focus of the Tribal program on 150 fpp fingerling production limits the degree of

hatchery intervention and allows the fish to rear and adapt to the Upper Green river release locations, and mimics the natural emigration strategy for Puget Sound ESU Fall chinook.

## **SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS**

Monitoring and Evaluation of Performance Indicators are briefly described in Section 1.10.

### **11.1) Monitoring and evaluation of “Performance Indicators” presented in Section 1.10.**

#### **11.1.1) Describe plans and methods proposed to collect data necessary to respond to each “Performance Indicator” identified for the program.**

This information is described in Section 1.9 and 1.10.

#### **11.1.2) Indicate whether funding, staffing, and other support logistics are available or committed to allow implementation of the monitoring and evaluation program.**

Program funding is subject to annual evaluation and support from WDFW, Northwest Indian Fisheries Commission, BIA, and other sources.

### **11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed fish resulting from monitoring and evaluation activities.**

None by Muckleshoot Tribe

## **SECTION 12. RESEARCH**

The Tribe is not currently engaged in formal research involving this program; however, we coordinate with WDFW who is currently engaged in juvenile salmon studies on the Green River.

### **12.1) Objective or purpose.**

### **12.2) Cooperating and funding agencies.**

### **12.3) Principle investigator or project supervisor and staff.**

### **12.4) Status of stock, particularly the group affected by project, if different than the stock(s) described in Section 2.**

### **12.5) Techniques: include capture methods, drugs, samples collected, tags applied.**

### **12.6) Dates or time period in which research activity occurs.**

### **12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.**

### **12.8) Expected type and effects of take and potential for injury or mortality.**

### **12.9) Level of take of listed fish: number or range of fish handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached “take table” (Table 1).**

- 12.10) Alternative methods to achieve project objectives.
- 12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.
- 12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed fish as a result of the proposed research activities.

## SECTION 13. ATTACHMENTS AND CITATIONS

### Attachments

Attachment 1: *“Current Planting Location and Schedule for Keta Creek hatchery Chinook above Howard Hanson Dam, Green River, Washington.”*

Attachment 2: *“CWT SUMMARY REPORT”*

### References

- Co-Managers Comprehensive Chinook management Plan for Puget Sound  
Cropp, T. and P. Hage. 1999, Green River Chinook: Estimation of hatchery strays in the naturally spawning population, Washington Department of Fish and Wildlife, Olympia.
- Dilley, S.J. 1993. Vertical distribution of juvenile salmonids in the fore bay of Howard Hanson Reservoir. U.S. Fish and Wildlife Service, Fisheries Resources Office, Olympia, Washington. 40 pp.
- Dilley, S.J. 1994. Horizontal and Vertical Distribution of Juvenile Salmonids in Howard Hanson Reservoir. U.S. Fish and Wildlife Service, Fisheries Resources Office, Olympia, Washington. 40 pp.
- Dilley, S.J. and R.C. Wunderlich. 1992. Juvenile anadromous fish passage at Howard Hanson Project, Green River, Washington. 1991. U.S. Fish and Wildlife Service, Fisheries Resources Office, Olympia, Washington.
- Dilley, S.J. and R.C. Wunderlich. 1993. Juvenile anadromous fish passage at Howard Hanson Project, Green River, Washington. 1992. U.S. Fish and Wildlife Service, Fisheries Resources Office, Olympia, Washington.
- Piper, Robert, et al., 1982, Fish Hatchery Management; United States Dept of Interior, Fish and Wildlife Service, Washington, DC.

**SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY**

“I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973.”

By submitting this material the Muckleshoot Indian Tribe is not conceding the application of the ESA to its hatchery operations. This information is primarily submitted to facilitate the ability of the NMFS to carry out it's duties under ESA consistent with the government to government relationship between the Muckleshoot Indian Tribe and the United States.

Name, Title, and Signature of Applicant:

Dennis Moore – Fish Enhancement Manager

Certified by\_\_\_\_\_ Date:\_\_\_\_\_

Table 1. Estimated listed salmonid take levels of by hatchery activity.

<b>Listed species affected:</b> _____ <b>ESU/Population:</b> _____ <b>Activity:</b> _____				
<b>Location of hatchery activity:</b> _____ <b>Dates of activity:</b> _____ <b>Hatchery program operator:</b> _____				
<b>Type of Take</b>	<b>Annual Take of Listed Fish By Life Stage (<i>Number of Fish</i>)</b>			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
<b>Observe or harass a)</b>				
<b>Collect for transport b)</b>				
<b>Capture, handle, and release c)</b>				
<b>Capture, handle, tag/mark/tissue sample, and release d)</b>				
<b>Removal (e.g. broodstock) e)</b>				
<b>Intentional lethal take f)</b>				
<b>Unintentional lethal take g)</b>				
<b>Other Take (specify) h)</b>				

**a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.**

- b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
- c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
- d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
- e. Listed fish removed from the wild and collected for use as broodstock.
- f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
- g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
- h. Other takes not identified above as a category.

**Instructions:**

- 1. An entry for a fish to be taken should be in the take category that describes the greatest impact.
- 2. Each take to be entered in the table should be in one take category only (there should not be more than one entry for the same sampling event).
- 3. If an individual fish is to be taken more than once on separate occasions, each take must be entered in the take table.